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Graphene Electronics and Optoelectronics¹

PHAEDON AVOURIS, IBM T.J. Watson Research Center

Because of its zero band-gap, the current in monolayer graphene cannot be effectively switched off as in conventional semiconductors. However, the limited field tuning of the current afforded by its DOS and its exceptionally fast carrier transport can be used to build advanced high-frequency analog devices. I will discuss the device physics, fabrication and operation of RF graphene transistors with cut-off frequencies up to 100GHz. Despite its gapless nature, built-in fields at graphene-metal contacts can also be used to construct ultrafast photoconductors. Such devices will be demonstrated and utilized for error-free detection of GBit/s optical data streams. Finally, we will discuss the electrical bandgap opening in bilayer graphene and demonstrate bilayer transistors operating at room temperature. Co-workers: Y.-M. Lin, F. Xia, T. Mueller, K. Jenkins, D. Farmer, C. Dimitrakopoulos, H.-Y. Chiu, A. Valdes-Garcia, A. Grill.

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